HEAT RESISTANT FOOD PACKING MATERIAL AND METHOD OF MANUFACTURING THE FOOD PACKING MATERIAL

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to an environmental food packing material made of natural fibers, and more particularly to a method of manufacturing the environmental food packing material that is stable to high temperature and can withstand quick freezing to low temperature.

[0003] 2. Description of the Prior Art

[0004] Conventionally, the raw materials for producing industrial packing material majorly include bagasse, phragmites communis and edge paper. The material is pulped by hydodamic pulping to form a pulp which is then cured on a metal mold. Subsequently, it is surface treated with water-soluble acrylic, latex, resin or coating agent containing EVA (Ethyl Vinyl Acetate).

[0005] However, it is known that resin and most coating agents cannot tolerate high temperature. While in the high temperature, resin and EVA would dissolve, mix with the food and be eaten. Undoubtedly, it would cause substantial harm to our health, even more seriously than that of Styrofoam or plastic tableware.

[0006] In the past decade, the package industry has developed various technologies for making environmental or degradable packages from different raw materials. For example, Taiwan Patent Publication No. 500746 discloses a method of making an environmental tableware composed of natural fibers. The manufacturing processes comprise (a) picking the nonpoisonous chaffy raw materials, including the straws, the grains, the waste residues and the starch rich plants; (b) washing the chaffy raw materials with water to remove the dusts, soil

and contaminants; (c) drying by centrifugation; (d) grinding the chaffy raw materials into powder (e) mixing 86% of the powder with 2% additive premix and 12% water evenly to form a mixture, the additive premix containing 90% special edible gum, 4.5% sulfate salt, 4.5% hard acid, and 1% treatment agent, in which the special edible gum is composed of 28% latex, 21% pectin and 21% protein gel and the treatment agent is composed of 80% special edible gum, 8% calcium chloride and 12% alum; (f) thermal forming the mixture into a product; (g) after stripping the product from the mold, drying and sterilizing the product by UV light, and spraying picture on the product, and drying and sterilizing the product again and (h) assuring the quality and packing the product.

[0007] In Taiwan Patent Publication No. 223008, a method of producing a biodegradable container is disclosed. Firstly, the animal connective tissue is treated with a super critical fluid to remove fat from the animal connective tissue and form the connective tissue protein. A mixture is prepared by mixing 2~40 % by wt. (percentage by weight) connective tissue protein, 60~90 % by wt. starchy grain or plant substance, 0~5 % by wt. salt, 0~10 % by wt. sugar and a desired amount of colorant. The mixture is extruded at a pressure of 2.07~5.86 MPa (equal to 300~850 psi) and a temperature of 180~200℃ for 10 seconds to 2 minutes. During extrusion, 10 % by wt. of water is added to render the material plasticity. The extruded material is molded by injection molding to form the container.

[0008] Anyway, it is known that the prior arts have many drawbacks. Until now, even the best quality biodegradable package contains some substances that cannot be entirely degraded by environmental microorganisms. In other words, complete degradation of the biodegradable package after use by environmental microorganisms has not yet been achieved. Such environmental packages eventually and inevitably pollute the environment. Moreover, those environmental packages generally cannot tolerate high temperature like the conventional operation temperature for oven. Therefore, they cannot be used directly in oven. Those environmental packages also cannot sustain quick freezing to low temperature e.g. at refrigerator. It is found that at quick freezing,

the environmental packages would crack. In the case that the food is not completely consumed, to preserve the leftover, the user has to put the leftover to another container that is stable to quick freezing to low temperature.

[0009] It is desired to have a food packing material that can sustain a temperature as high as the common operation temperature in ordinary oven and is stable quick freezing to low temperature in refrigerator.

SUMMARY OF THE INVENTION

[0010] Accordingly, the primary object of the present invention is to provide an environmental food packing material made of natural fibers, which is heat resistant and can tolerate a temperature above 200 ℃ without crack or deterioration. Thereby, the packing material can be used for packing of food and be heated directly to a high temperature in a conventional oven.

[0011] Another object of the present invention is to provide an environmental food packing material made of natural fibers, which can tolerate a temperature as low as -35℃ without deterioration. Thereby, the packing material can be used for packing of food and be cooled to a freezing temperature in refrigerator.

[0012] A further object of the present invention is to provide an environmental food package or container made of natural fibers, the surface of which will not melt or stick to the food contained in the package even at high temperature. Hence, it secures the safety of food consumption.

[0013] A still further object of the present invention is to provide a method for producing an environmental food packing material made of natural fibers. The packing material is stable to high temperature and quick freezing, and is safe for packing of food.

[0014] To achieve the above objects, in accordance with a preferred embodiment of the present invention, an environmental food packing material and

the method of producing the packing material are provided. A first auxiliary agent containing anionic substances is prepared by mixing aluminum silicate and natural wax emulsion. Pulp containing natural fibers and water are fed to a pulper to mix uniformly with the first auxiliary agent to form a pulp premix. A second auxiliary agent containing non-ionic and cationic substances is prepared by mixing fluorochemical series resin, polymer compound, aliphatic polyamine and alkyl acryl copolymer. The pulp premix and second auxiliary agent are fed to a stock tank for mixing uniformly to form a pulp mixture which is fed to a paper molding machine for thermal forming and producing the packing material. Subsequently, the packing material is coated with releasing agent mixture and dried.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] **Fig. 1** is a schematic block diagram showing a system for manufacturing an environmental food packing material in accordance with a preferred embodiment of the present invention; and

[0016] **Fig. 2** is a flowchart showing the method of manufacturing the environmental food packing material of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0017] Please refer to **Figs. 1** and **2**. **Fig. 1** is a schematic block diagram showing a system for manufacturing an environmental food packing material in accordance with a preferred embodiment of the present invention. **Fig. 2** is a flowchart showing a method of manufacturing the environmental food packing material. As shown, appropriate amounts of aluminum silicate **1a** and natural wax emulsion **1b** are separately added to a first tank A and mixed uniformly to prepare a first auxiliary agent **1** containing anionic substances. The aluminum silicate **1a** is a sheet form anionic hydrophobic substance that can shorten the dehydration and drying time of paper molding and render the product heat resistance to high temperature. The natural wax emulsion **1b** is an anionic water

repellent and made from natural wax. With the natural wax emulsion **1b**, the packing material keeps good water repellence. Furthermore, the natural wax emulsion **1b** enhances the surface tension and strength of the packing material.

[0018] Then, the first auxiliary agent **1** is then fed to a pulper **7**. Meanwhile, a pulp **3** containing plant fibers and water **4** are separately added to the pulper **7**. The materials are stirred for 10 to 40 minutes to mix evenly and form a pulp premix **5**. For 1 part by wt. of pulp **3**, 99 parts by wt. of water **4** is added. The pulp **3** is made from a mixture of plant, which is composed of phragmites communis, sugar cane bagasse, straw pulp, wheat straw pulp, bamboo pulp and wood pulp.

[0019] The amounts of aluminum silicate **1a** and natural wax emulsion **1b** added are also based on the amount of pulp **3** used. Preferably, for 100 % by wt. (percentage by weight) of pulp **3**, 50~80 % by wt. of aluminum silicate **1a** and 1.5~9 % by wt. of natural wax emulsion **1b** are used. Accordingly, 990% by wt. of water is added.

[0020] Meanwhile, appropriate amounts of fluorochemical series resin **2a**, polymer compound **2b**, aliphatic polyamine **2c** and alkyl acryl copolymer **2d** are separately added to a second tank B to form a second auxiliary agent **2** containing non-ionic and cationic substances. The amounts of the various substances added are also based on the amount of pulp **3** used. Preferably, for 100 % by wt. of pulp **3**, 0.75~5.4 % by wt. of fluorochemical series resin **2a**, 0.9~7.2 % by wt. of polymer compound **2b**, 0.15~0.54 % by wt. of aliphatic polyamine **2c** and 0.75~9 % by wt. of alkyl acryl copolymer **2d** are used.

[0021] The fluorochemical series resin **2a** is a non-ionic water repellent and oil repellent. It helps to keep the packing material good water and oil repellence. The polymer compound **2b** is formed of cationic polymer, and is a neutral sizing agent. Preferably, the polymer compound **2b** is a macromolecular polymer. The aliphatic polyamine **2c** is a cationic fixative. It is found that fixative works well with water repellent. When fixative and water repellent are used at the same time, fixative can enhance the interaction between water repellent and sizing

agent. It also enhances the water repellence of water repellent. The alkyl acryl copolymer **2d** is a cationic water repellent.

[0022] The pulp premix **5** and the second auxiliary agent **2** are fed to a stock tank **9** and mixed evenly to form a pulp mixture **6**.

[0023] Also, a releasing agent **8a**, cross-linking agent **8b** and dilution water **8c** are separately fed to a third tank C and mixed uniformly to form a releasing agent mixture **8**. The releasing agent mixture **8** is then supplied to a releasing agent coating machine **10**. The amount of the cross-linking agent **8b** is based on the amount of releasing agent **8a** used. Preferably, for each 100 parts by wt. of releasing agent **8a**, 5 parts by wt. of cross-linking agent **8b** is applied. The cross-linking agent **8b** is able to initiate polymerization, and makes the packing material to cure.

[0024] The releasing agent mixture **8** is composed of releasing agent **8a**, cross-linking agent **8b** and dilution water **8c**. In application, the amount of releasing agent **8a** used is related to the amount of dilution water **8c**. Supposing the total amount of releasing agent **8a** and dilution water **8c** used is 100 parts by wt., the amount of releasing agent **8a** added is preferably 10~100 parts by wt., while the amount of dilution water **8c** added is 90~10 parts by wt. For example, **10** parts of releasing agent **8a** is added when 90 parts of dilution water is added. In the case when 100 parts of releasing agent is used, no dilution water is required.

[0025] All the materials in the auxiliary agents are conventionally and commercially available. They are harmless to human body and generally recognized as safe for use in food packing material. It should be noted that the materials should be used and diluted in accordance with the specifications provided by the manufacturers. Moreover, all the materials are not harmful to human body.

[0026] Subsequently, the pulp mixture **6** is fed to a paper molding machine **9a** for thermal forming, producing the packing material. The packing material is

conveyed to the releasing agent coating machine **10** for coating of releasing agent mixture **8**. Finally, the packing material is conveyed to a drier **11** for drying. The drying temperature is 120℃ and drying time is 15 seconds. After drying, the packing material is packed.

[0027] The method for producing the food packing material is shown in **Fig. 2**. In step **101**, the first auxiliary agent **1** containing anionic substances is prepared by adding appropriate amounts of aluminum silicate **1a** and natural wax emulsion **1b** separately to a first tank A and mixed uniformly.

[0028] In step **102**, pulp **3** containing plant fibers, water **4** and the first auxiliary agent **1** are then fed separately to the pulper **7** and stirred for 10 to 40 minutes to mix evenly and form a pulp premix **5**. In step **103**, appropriate amounts of fluorochemical series resin **2a**, polymer compound **2b**, aliphatic polyamine **2c** and alkyl acryl copolymer **2d** are separately added to the second tank B to form the second auxiliary agent **2** containing non-ionic and cationic substances. The pulp premix **5** and the second auxiliary agent **2** are fed to the stock tank **9** and mixed evenly to form a pulp mixture **6** in step **104**. Subsequently, in step **105**, the pulp mixture **6** is fed to a paper molding machine **9a** for thermal forming, producing the packing material.

[0029] In step **106**, the releasing agent **8a**, cross-linking agent **8b** and dilution water **8c** are separately fed to the third tank C and mixed uniformly to form the releasing agent mixture **8**. The releasing agent mixture **8** is then supplied to the releasing agent coating machine **10**. In step **107**, the packing material is conveyed to the releasing agent coating machine **10** for coating of releasing agent mixture **8**. Finally, the packing material is conveyed to a drier **11** for drying in step **108**. The drying temperature is 120℃ and drying time is 15 seconds. After drying, the packing material is packed in step **109**.

[0030] It should be noted that the present invention is mainly made of natural fibers, and does not include any plastic material. As mentioned, all additives in the present invention are harmless to human body. Apparently, the present

invention is an environmental, safe and harmless packing material. Moreover, the present invention can be used for manufacturing of all kinds of package or containers. After use, it can be recycled for producing non-food package. It substantially reduces the use of resources. In the case that the package is disposed after use, it will not generate poisonous gas when it is burnt in crematorium, or dissolve to release harmful substances. With proper treatment, the package can be mixed with fertilizer and recycled for use in farming.

[0031] It is apparent that although the present invention is illustrated with the description of a preferred embodiment of the present invention, it is contemplated that there may be changes and modifications in the described embodiment and examples that can be carried out without departing from the scope of the invention which is intended to be limited only by the appended claims